NovaTorque®

PremiumPlus+™ Series
Brushless Permanent Magnet Motors

Installation and Operation Manual

See Safety Information on Page 3

NovaTorque®

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1. Safety Information

1.1 Safety Overview

Only qualified personnel should attempt installation, operation or maintenance of this equipment. Do not install, operate or perform maintenance until all warnings and cautions have been reviewed and are understood.

Contact NovaTorque with any questions or concerns before proceeding if you are uncertain about any details in either safety precautions or operation instructions.

1.2 Safety Conventions

The following symbols are used in this manual:

Warning: Refers to a procedure which, if not properly executed, could result in serious or fatal injury, property damage or both. Do not proceed beyond a warning until indicated conditions are understood and fully met.

Warning - High Voltage: Refers specifically to a warning regarding risk of electric shock from high voltage. Do not proceed beyond a warning until indicated conditions are understood and fully met.

Caution: Refers to a procedure which, if not properly executed, could result in minor injury or damage to equipment. Do not proceed beyond a caution until indicated conditions are understood and fully met.

Note: This label calls attention to important information. Read this information before continuing.

1.3 Electrical Safety

HIGH VOLTAGE CAN BE GENERATED EVEN WHEN POWER IS DISCONNECTED

Due to the nature of the permanent magnet used in NovaTorque motors, ***high voltage can be generated whenever the motor is rotating, even if the power is off***. It is extremely important to make sure the motor cannot be rotated during servicing by the drive or any auxiliary equipment. If the load can rotate the motor without power being applied, install a manual disconnect to open the motor leads before servicing. Install an interlock to connect the manual disconnect to the control circuits of the drive. Failure to observe these recommendations could lead to serious or fatal injury or property damage.

ELECTRICAL SHOCK HAZARD

All electrical connections should be made only by qualified electrical personnel and in accordance with all applicable codes, ordinances and sound practices. Be sure you are familiar with NEMA safety standards for selection, installation, and operation of electrical motors, as well as the National Electrical Code. Unsafe installation or use could lead to serious injury, property damage, and/or death.

ELECTRICAL LIVE CIRCUIT HAZARD

Electrical shock can cause serious or fatal injury. Do not touch any electrical connections until the power to the motor and all accessory devices has been disconnected and locked out.

ELECTRICAL GROUNDING HAZARD

Do not apply power to the motor until it has been properly grounded per the National Electrical Code Article 430, as well as any applicable local codes and ordinances. Failure to properly ground motors may cause serious or fatal injury and/or property damage.

AUTOMATIC RESET PROTECTOR HAZARD

Do not use automatic reset protectors if restarting the motor automatically would pose a hazard to personnel or equipment. If unsure, avoid automatic reset devices. Failure to follow this warning may cause serious or fatal injury and/or property damage.

MAGNETIC FIELD HAZARD

Pacemaker Danger- Permanent magnet motors can generate a magnetic field in the vicinity of the motor location and can pose a serious health risk to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk of injury, such persons should stay away from the vicinity of the motor.

1.4 Mechanical Safety

MOTOR HANDLING

Follow NovaTorque recommended procedures for lifting, moving, storing, installing, and connecting motor to external components with belts. Avoid over-tensioning drive belts or lifting connected devices with the drive shaft. Motor mounts are intended to hold the weight of the motor only. Failure to follow this recommendation could result in motor damage.

PREVENT LIFTING INJURY

Use care when lifting heavy equipment to prevent injury. For heavy equipment over 50 lbs (22 kg), use a team lift and proper lifting technique.

POSSIBLE HIGH TEMPERATURE

Surfaces in motor enclosures or accessory equipment may reach harmful temperatures. Take steps to avoid coming into contact with hot surfaces while installing, operating, or maintaining equipment. Failure to do so could result in personal injury.

ROTATING PARTS HAZARD

This motor may be connected to other machinery with exposed rotating parts. Keep extremities, hair, clothing, and tools secured a safe distance from any moving parts. Only qualified personnel should install, operate, or maintain the motor and accessory equipment. Failure to follow this warning could result in serious personal injury, death and/or property damage.

PROTECTIVE SAFEGUARDS MUST REMAIN IN PLACE

Do not bypass safety interlocks or other safeguards. Safety devices will only provide protection if used in the manufacturer’s recommended fashion.

LOOSE PARTS HAZARD

Ensure all devices are properly connected and remove any unused shaft pins before applying power to the motor. Rotation can cause loose parts to be ejected and cause injury. Improper coupling can cause harm to personnel or equipment if the load decouples unexpectedly.

DISCONNECT AUXILIARY DEVICES PRIOR TO MOTOR MAINTENANCE

Before maintaining the motor, disconnect any connected devices that could cause the motor to turn. Failure to do so could result in physical injury or damage to the motor.

POSSIBLE NOISE HAZARD

While the NovaTorque PremiumPlus+ motor operates quietly, other components in the system may have significant noise levels when in operation. Wear adequate ear protection to reduce harmful effects to hearing.

2. Receiving and Inspection

Each NovaTorque motor meets rigorous standards at the factory prior to shipment. Upon receipt of your new motor, perform the following inspections immediately.

2.1 Initial Inspection

- Inspect packaging for any shipping damage. Report any damage immediately to your shipping carrier and NovaTorque customer support.
- Check contents against packing list, verifying nameplate for conformance with your purchase order.
- Allow the motor to come to room temperature before unpacking it, in order to prevent possible condensation.

2.2 Motor Handling

PREVENT LIFTING INJURY

Use care when lifting heavy equipment to prevent injury. For heavy equipment over 50 lbs (22 kg), use a team lift and proper lifting technique.

MOTOR HANDLING

Follow NovaTorque recommended procedures for lifting, moving, storing, installing, and connecting motor to external components with belts. Avoid over-tensioning drive belts or lifting connected devices with the drive shaft. Motor mounts are intended to hold the weight of the motor only. Failure to follow this recommendation could result in motor damage.

Rotate the motor shaft by hand to ensure it rotates smoothly.

When lifting and transporting the motor, use safe lifting procedures, with two people lifting the main body of the motor. *Do not use the junction box to lift the motor, and do not lift by the shaft.* If the motor is coupled to a load device, use slings as necessary to maintain proper lifting angle and to avoid any side torque on the shaft or extra load on the motor mounts.

2.3 Storage

- Motors that are not put into service immediately should be stored in a clean, dry environment indoors. Protect motors from dust and vibration, and avoid large temperature swings.
- NovaTorque motors are permanently lubricated, and require no additional lubrication.
- For motors in storage, rotate motor shaft 5-10 times by hand every three months.
- When motor is readied for use after storage, follow above precautions for lifting and handling motor. Inspect motor visually and rotate shaft, ensuring the motor has not suffered any corrosion in storage.

3. Installation

Only qualified personnel should attempt installation, operation or maintenance of this equipment. Do not install, operate or perform maintenance until all warnings and cautions have been reviewed and are understood.

Contact NovaTorque with any questions or concerns before proceeding if you are uncertain about any details in either safety precautions or operation instructions.

ELECTRICAL SHOCK HAZARD

All electrical connections should be made only by qualified electrical personnel and in accordance with all applicable codes, ordinances and sound practices. Be sure you are familiar with NEMA safety standards for selection, installation and operation of electrical motors, as well as the National Electrical Code. Unsafe installation or use could lead to serious injury, property damage and/or death.

ELECTRICAL LIVE CIRCUIT HAZARD

Electrical shock can cause serious or fatal injury. Do not touch any electrical connections until the power to the motor and all accessory devices has been disconnected and locked out.

Figure 1. NovaTorque motor

3.1 Location

Select the mounting location for the motor carefully. Consider the following when choosing the location: Motors should be protected from dust, vibration, moisture, corrosive liquids or vapors and direct sunlight, and there should be good ventilation and accessibility for inspection and maintenance.

The ambient temperature for the motor location should be between -10 and 40ºC (14–105ºF).

3.2 Mounting

The motor should be securely attached to a firm, rigid surface with minimum vibration to establish good alignment with the driven load and the motor shaft. Failure to secure to a proper mounting location can cause damage to the motor. NovaTorque motors can be mounted on the C-face or optionally via a foot mount.

For details on mounting the motor drive, refer to the installation section of the drive manual.

3.3 Alignment

Proper alignment of the pulley, sprocket, or gear with the motor shaft is critical. Good alignment minimizes vibration and maximizes equipment life. Misalignment could cause damage to the motor and/or shorten the life of the motor. Whichever connector is chosen, it should be located as close to the shoulder shaft as possible.

3.4 Coupling

Do not force components onto the shaft. Hammering or prying components onto the motor shaft can damage the motor.

Direct coupling: Whenever possible, use flexible couplings to secure the motor shaft to the load. Use dial indicators to check alignment. Mechanical vibration or roughness during operation may indicate misalignment; consult equipment manufacturer for assistance.

Contact NovaTorque Application Engineering if assistance with motor mounting or coupling is required.

3.5 Guarding

Guards must be installed to protect personnel and equipment from rotating parts. Couplings, belts, pulleys, fans and other rotating parts must have guards properly installed. Failure to do so could cause serious injury to personnel.

Depending on motor application, guarding can be accomplished by enclosing the motor within structural or decorative features of the driven load, or with covers over rotating parts. In either case, make sure covers are rigid enough to prevent accidental injury to persons working in close proximity to the machine while running.

3.6 Electrical Connection

Before proceeding, read section 1.3 Electrical safety on page 3 on electrical safety guidelines. Failure to follow recommendations can result in serious personal injury or damage to equipment.

Setup personnel are responsible for proper connection and tuning of the motor with the selected variable frequency drive. Contact Drive manufacturer or NovaTorque with any questions or to clarify proper installation procedures.

3.7 Drive to Motor Cabling

ELECTRICAL CONNECTION HAZARD

The NovaTorque motor is a permanent magnet motor and therefore requires an electronic Variable Frequency Drive to operate. Not all VFDs will support permanent magnet motors, but several vendors have models that do. Contact NovaTorque for a list of VFDs that have been tested with the NovaTorque motor. Any VFD selected should comply with UL 508C and have the maximum current to be sourced by the drive set no higher than 15 Amps RMS per phase. Motor leads between the variable frequency drive and motor must be properly connected and insulated. Improper connection could lead to shorts and arcing, thereby causing equipment damage or personal injury. Take steps to make sure all electrical connections are properly secured.

NovaTorque motors can be operated from variable frequency drives rated for 3 phase 208-230V operation or 3 phase 400-460V operation. In this section, operation with a drive rated for 230V operation will be referred to as 200V or Low Voltage configuration. Operation with a drive rated for 460V operation will be referred to as 400V or High Voltage configuration.

Refer to the following table to determine the proper wire gauge for connecting motors at a given cable length. Consult the wiring guidance in the manual for the selected variable frequency drive and follow National Electrical Code practices for the installation. The field installed conductors must be rated for 75 degrees C.

Length (ft)	200V wiring AWG Wire Gauge	400 V wiring AWG Wire Gauge
< 30 feet	10	14
> 30 feet	8	14

Ensure the motor is properly grounded, securing a grounding wire from the ground stud in the junction box to earth ground.

3.8 Power Cabling to Drive

Refer to variable frequency drive manual for connection instructions.

4. Operation

4.1 Startup Operation

Review all safety information in section 1. Safety Information before proceeding.

Review Drive Operator's Manual for an overview of drive control panel / keypad operation.

Before beginning the initial operational checkout, review the entire procedure to make sure all steps are understood. Contact NovaTorque with any questions before proceeding.

4.2 Initial Operational Checkout

The initial operational checkout assumes the following:

- The motor and drive have been mounted and properly cabled. See Drive operator's manual for specific instructions regarding installation of the motor drive.
- The motor is not yet connected to the load or any auxiliary devices.

Check installation:

- Mechanical checks: Check mounting bolts for tightness. Rotate motor shaft to make sure it rotates freely.
- Electrical checks: Make sure all electrical connections are well made, properly insulated, and have electrical continuity with a multimeter. Replace any panels or covers that were removed in the installation process before energizing the drive or motor.
- Apply power to the motor-drive system. Inspect the drive to see that the control panel or keypad is illuminated.
- Start the motor at a low speed to confirm that the motor shaft is turning.

If the motor rotates in the opposite to expected direction, any two leads can be reversed to change the direction. Disconnect and lock out power to the motor and drive system, then reverse two of the three power leads into the motor. Repeat the installation operational checkout procedure to verify the motor is turning in the desired direction.

4.3 Coupled Startup

After the motor has successfully been started with the initial operational checkout, follow this procedure to start up the motor with the coupling installed.

- Install the motor coupling. Check the motor coupling is properly aligned and not binding.
- Ensure all safety shields and guards are in place.
- The first coupled rotation should be performed unloaded. Rotate the motor and check that the coupling is rotating smoothly and is not translating excessive vibration back to the motor.
- Attach the load and rotate the motor. The motor can now be fully operated within specified limits.

5. Maintenance

5.1 Safety Overview

Only qualified personnel should attempt installation, operation or maintenance of this equipment. Do not install, operate or perform maintenance until all warnings and cautions have been reviewed and are understood.

ELECTRICAL LIVE CIRCUIT HAZARD

Electrical shock can cause serious or fatal injury. Do not touch any electrical connections until the power to the motor and all accessory devices has been disconnected and locked out.

5.2 General Inspection

Inspect motors regularly, every three months or after 500 hours of operation, whichever occurs first. Keeping motors clean and ventilation openings clean prolongs the life of the equipment. Perform the following checks during inspection:

- Check motor exterior for oily residue, lint, water, or dirt. Residue on the motor surface can interfere with ventilation.
- Check mechanical and electrical connections for tightness.

5.3 Lubrication

NovaTorque motors are permanent magnet motors with permanently lubricated bearings. Re-lubrication of motor bearings is not necessary and is not part of scheduled maintenance.

6. Troubleshooting

Problem	Cause	Resolution
Motor fails to start	No power to drive, or drive is in fault condition	Check that drive is powered and is not in a fault condition. Refer to Motor Operation section of drive manual as necessary. If the drive fault re-occurs after clearing, contact NovaTorque technical support.
	Motor is wired incorrectly	Check wiring against nameplate diagram.
	Driven load exceeds motor capacity	Match motor to driven load.
	Motor coupling or load is bound up or jammed	Test motor unbound, and realign or replace coupling.
Motor rotates in wrong direction	Motor is wired incorrectly	Switch two of the three supply inputs to the motor, and perform unloaded installation test per Initial operational checkout on page 10.

Problem	Cause	Resolution
Motor has been running, then stalls or fails to restart	No power to drive, or drive is in fault condition	Check that drive is powered and is not in a fault condition. Refer to Motor Operation section of drive manual as necessary. If the drive fault re-occurs after clearing, contact NovaTorque technical support.
	Motor is overloaded or load has seized	Check load and coupling for free movement. Check motor torque rating against load requirements.
	Over-temperature shut-off has occurred and does not automatically reset	Check drive over-temperature shutoff switch and reset or re-configure as necessary.
Excessive vibration	Motor is misaligned to load	Realign connection to load.
	Loose or weak mounting support	Check mounting support for tightness and rigidity.
	Unbalanced load (especially in directly connected loads)	Make sure load is balanced. Check motor by itself. If vibration persists contact NovaTorque for assistance.
	Improper belt tension on multiple belts	Check all belts for deflection. Make sure all belts are replaced at the same time; avoid mixing old and new belts.
	Motor is resonating	Tune system to eliminate resonance-contact NovaTorque for assistance.
Unusual motor noise – rubbing, grinding or squealing	Motor is not wired properly	Check motor wiring against nameplate diagram.
	Contact between stationary and rotating parts	Inspect system for any areas which rubbing could be occurring, and re-configure system to eliminate contact. Check motor by itself if necessary, rotating first by hand to make sure the shaft spins freely, then rotate unloaded. If the source of the trouble cannot be located, contact NovaTorque support.
	Loose belt	Some belt squealing is normal when starting up. Check belt for proper tension.
Motor overheats or repeated over-temperature shutdown by drive	Driven load exceeds motor specifications	Check Drive for fault condition. If Over-current fault is occurring the loading may be exceeding the motor specification. Ensure that the load is not being increased due to binding.
	Ambient temperatures are too high	Motor can be installed in environments up to 40°C.
	Motor is not properly ventilated or ventilation openings are blocked.	Check ventilation path and air flow. Inspect motor for conditions that could restrict ventilation.

7. Warranty

STATEMENT OF LIMITED WARRANTY

NovaTorque Inc. warrants its commercial motors and motor systems against defects in workmanship and materials. NovaTorque motors are warranted for 18 months from the date of shipment to NovaTorque's customer from our manufacturing facility.

If you experience a problem with a NovaTorque motor, please contact NovaTorque's Customer Service staff. In the event that, based upon NovaTorque's own examination, any of its products are found to be defective in materials or workmanship, NovaTorque's responsibility shall be, at its own option, to repair or replace any such product, provided that:

1. The defective motor is returned within the 18-month Warranty period, prepaid by the customer, to NovaTorque's facility. Please include an explanation of the defect or problem, a description of the way in which the NovaTorque motor is used, and your name, address, and telephone number.
2. The motor has not been subjected to misuse, negligence, accident, or operation not in accordance with the User's Manual. Problems with NovaTorque motors can be due to improper maintenance, faulty installation, non-NovaTorque additions or modifications, or other problems not due to defects in NovaTorque workmanship or materials. If NovaTorque determines that the problem with a NovaTorque product is not due to defects in NovaTorque workmanship or materials, then the customer will be responsible for the cost of any necessary repairs.

NovaTorque is not responsible for removal and shipping of the NovaTorque motor to our facility, the reinstallation of the NovaTorque motor upon its return to the customer, or any incidental, indirect, or consequential damages resulting from the defect, removal, reinstallation, or shipment of the NovaTorque product.

This Limited Warranty and Service Policy represents NovaTorque's sole and exclusive warranty obligation with respect to NovaTorque products. NovaTorque's liability to a customer or any other person shall not exceed the sales price of the NovaTorque product. NovaTorque disclaims all other express and implied warranties, including the implied warranties of fitness for a particular purpose and merchantability.

NovaTorque products requiring warranty service should be shipped to the following address, prepaid by the Customer:

NovaTorque, Inc.
3501 Gateway Blvd
Fremont, CA 94538
Tel: 510-933-2700
Email: CustomerService@novatorque.com

NovaTorque, Inc.
3501 Gateway Blvd
Fremont, CA 94538

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